

What is claimed is:

1. A method of forming a metal layer on a substrate, comprising:
providing a substrate to an electroplating cell, wherein the electroplating cell has a porous pad and an electrolyte solution therein;
contacting portions of the substrate to the porous pad; and
forming a metal layer onto the substrate, wherein the metal layer is formed on the substrate by alternately applying a first electrical potential and a second electrical potential to the electrolyte solution, and wherein the first electrical potential deposits metal on the substrate while the second electrical potential removes metal from the contacted portions of the substrate.
2. The method of claim 1 wherein the substrate and the porous pad move relative to one another during metal layer formation.
3. The method of claim 1 wherein the metal layer comprises copper (Cu), tungsten (W), nickel (Ni), aluminum (Al), gold (Au), silver (Ag), and combinations thereof.
4. The method of claim 1 wherein the porous pad contacts portions of the substrate with a pressure in a range of about 0.1 phi and about 5 psi.
5. The method of claim 1 wherein the electrolyte solution comprises one or more materials selected from the group of water, pH adjusting agents, and metallic species.
6. The method of claim 1 wherein the first electrical potential has an opposite polarity from that of the second electrical potential.

- | Table 1. Demographic characteristics of the study population | |
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| Age (years) | 50.0 ± 10.0 |
| Gender | |
| Male | 50.0% |
| Female | 50.0% |
| Education (years) | 12.0 ± 2.0 |
| Marital status | |
| Married | 80.0% |
| Single | 20.0% |
| Occupation | |
| Professional | 30.0% |
| Managerial | 20.0% |
| Technical | 10.0% |
| Service | 20.0% |
| Unemployed | 20.0% |
| Income (USD/month) | 1,500 ± 500 |
| Health status | |
| Good | 70.0% |
| Fair | 20.0% |
| Poor | 10.0% |